

PATENT SPECIFICATION

DRAWINGS ATTACHED

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Improvements relating to the production of hollow metal bodies by pressing.

COMPLETE SPECIFICATION

We, KABEL-UND METALLWERKE NEU-MEYER AKTIENGESELLSCHAFT, of 70-72, Klingenhofstrasse, Nuremberg, Germany, a Joint Stock Company organised under the laws of Germany, do hereby declare the invention, for which we pray that a patent may be granted to us, and the method by which it is to be performed, to be particularly described in and by the following statement:

The invention relates to a method and apparatus for the production by cold pressing of hollow bodies of steel or other metal having an external flange, preferably of steel, as a result of deformation without removal of metal. Such hollow bodies have hitherto been made in a number of successive pressing operations, usually with the interposition of annealing. This method is very troublesome, time-consuming and expensive.

The method according to the invention makes it possible to produce hollow metal bodies with a flange as a result of the cold-deformation of a blank, more particularly of steel, in a single operation. By giving an appropriate form to the tool which is used for carrying out the new method, the flange on the cold-pressed hollow body can be given any desired shape and position.

In the method according to one aspect of the present invention, the blank of steel or other metal is deformed in a die having a radial or lateral recess, and part of the material of the blank is displaced radially outwards into the recess to form the flange as a result of being penetrated or perforated axially by a perforating punch engaging the middle part of the blank, the flange being given its final shape by means of an annular punch which enters an annular space between the perforating punch and the wall of the die containing the blank and the end of which punch forms an end wall of the radial or lateral recess. From another aspect of the present invention, the blank of steel or

other metal is placed in a die having an opening of greater diameter than the blank, an annular punch is then introduced into the annular space between the blank and the surrounding wall of the die, and a perforating punch is then forced on to the middle part of the blank to perforate or penetrate it axially and thus to displace part of the material of the blank radially outwards into an annular recess, an end wall of which recess is formed by the end of the annular punch, so as to form the external flange.

A tool for carrying out the invention comprises a one-piece die, an annular punch which is adapted to be moved into the end of an annular space formed between an inserted blank and the adjacent wall of the die so as to close this space and form an end wall of an annular recess, and a perforating punch which is adapted to be forced axially against the middle of the blank to penetrate or perforate it axially so as to displace material into the annular recess to form a flange, the arrangement being such that after the withdrawal of the annular punch from the one-piece die the flanged hollow body can be removed from the die by pushing it out of one end.

One way of carrying the invention into effect is illustrated, by way of example, in the accompanying drawings, in which:

Fig. 1 is a cross-section through an example of a tool for carrying out the method of the invention, suitable for use in a single-acting press and with the parts shown in an initial position;

Fig. 2 is a similar view of the tool as it is at the beginning of the pressing operation;

Fig. 3 is a similar view but showing the parts in two different stages of the pressing operation.

Referring to the drawings, 1 indicates the one-piece (i.e. unsplit or undivided) die which is secured in the reinforcement 2, the stepped bore 1' of the die being closed at 90

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the bottom by the counter-punch or end-support 3. The reinforced die 1 is secured in a known manner on the table of the press. The press-tool further consists of a punch 4, 5 which is disposed axially in the press and serves for the perforation of the blank 11 inserted in the die, and an annular punch 7. The punch 4 is mounted in a bush 5 and secured together with the latter in the head 10 6 of the press. The bush 5 and punch 4 form a stepped press punch. The punch 4 is guided by means of the bush 5 in the annular punch 7. The annular punch 7 is secured within the plate 8 and moreover is 15 so made and arranged that during the pressing operation it closes the opening of the die, i.e. the annular space formed between the wall of the die and the upper part of the inserted blank 11. The annular space 12 20 (Fig. 2) remaining between the shoulder 1' of the die and the end face of the annular punch 7 serves for the reception of the blank metal for the formation of an outer flange 11', as may be seen from Fig. 3. The carrier 25 8 of the annular punch 7 is connected, by means of studs 9 with the interposition of compression springs 10, to the head 6 of the press. By reason of the fact that the punch 4, which serves for effecting perforation, is 30 guided in the annular punch 7 by means of the sleeve or bush 5 which receives it, an annular space 7' is formed above the inserted blank 11, in which space a part of the material of the blank can rise axially during 35 the pressing operation.

The above-described press-tool operates as follows:

A blank is inserted into the one-piece die 1, the blank being in the form of a section 40 of rod or bar or of a stepped rough pressing 11, as is illustrated in Figs. 1 and 2. On the downward movement of the head 6 of the press, the two punches 4 and 7 are carried down until the carrier 8 of the annular 45 punch 7 comes on to the die 1, as is illustrated in Fig. 2. In this position of the parts, the annular punch 7 is disposed in the annular space between the blank 11 and the wall of the die, so that the annular space 12 50 which serves for the formation of the flange is closed at the top. The actual pressing operation begins with further downward movement of the head 6 of the press, the punch 4, which is now driven alone, engaging the middle area of the blank 11 and, as 55 a result of perforating it, displaces the material radially and axially into the annular spaces 7' and 12 and against the counter-punch 3. The blank then assumes the form 60 to be seen from the left-hand half of Fig. 3. As soon as the annular space 12 is to some extent filled by material, the annular punch 7 with its carrier 8 is raised, shortly before 65 4 as a result of the further radial displace-

ment of material, by the amount indicated at X, the springs 10 being compressed. The head 6 of the press comes against the upper end face of the annular punch 7, which now receives from the head of the press a downwardly-directed pressure. As a result the 70 radially-displaced material in the annular space 12 is forced to fill this space completely, so that the flange is given the desired final shape with certainty. The finished- 75 pressed hollow body with its flange may be removed from the die 1 by pushing it out of one end by means of the counter-punch 3.

By means of the press-tool according to 80 the invention there may be formed by cold pressing hollow metal bodies having a flange at the lower end (bottom) of which is provided an extension of any desired formation.

The method described makes possible an 85 economical mass production of hollow bodies of any desired shape having an external flange, especially from steel, as a result of cold-forming in a single working 90 operation. As a result of appropriate formation of the die 1 and of the annular punch 7, the flange 11' can be provided as desired at the top, at the bottom, or in the middle of the hollow body.

WHAT WE CLAIM IS:

1. A method of making a hollow metal 95 body having an external flange by cold-pressing a blank of steel or other metal, in which the blank is deformed in a die having a radial or lateral recess, and part of the 100 material of the blank is displaced radially outwards into the recess to form the flange as a result of being penetrated or perforated axially by a perforating punch engaging the 105 middle part of the blank, the flange being given its final shape by means of an annular punch which enters an annular space between the perforating punch and the wall of the die containing the blank and the end 110 of which annular punch forms an end wall of the radial or lateral recess.

2. A method of making a hollow metal body having an external flange by cold-pressing a blank of steel or other metal, in 115 which the blank is placed in a die having an opening of greater diameter than the blank, an annular punch is then introduced into the annular space between the blank and the surrounding wall of the die, and a perforating punch is then forced on to the 120 middle part of the blank to perforate or penetrate it axially and thus to displace part of the material of the blank radially outwards into an annular recess, an end wall of which recess is formed by the end of the 125 annular plunger, so as to form the external flange.

3. A method according to Claim 1 or Claim 2, in which during the outward displacement of the material part of the mate- 130

rial is displaced axially into an annular space between the perforating and annular punches.

4. A method according to any preceding claim, in which, after the radially-outward displacement of material into the annular recess to form the flange, the annular punch is moved further to give the flange its final shape.

5. A method according to Claim 4, substantially as hereinbefore described with reference to the accompanying drawings.

6. A hollow metal body made in accordance with the method of any preceding claim.

7. A tool for carrying out the method of any of the preceding claims 1 to 5 comprising a one-piece die, an annular punch which is adapted to be moved into the end of an annular space formed between an inserted blank and the adjacent wall of the die so as to close this space and form an end wall of an annular recess, and a perforating punch which is adapted to be forced axially against the middle of the blank to penetrate or perforate it axially so as to displace material into the annular recess to form the flange on the blank, the arrangement being such that after the withdrawal of the annular punch from the one-piece die the flanged hollow-body can be removed from the die by pushing it out of one end.

8. A tool according to Claim 7, in which the perforating punch, which is guided inside the annular punch is stepped so as to form an annular space between these two punches into which a part of the material of the blank can move axially during the pressing operation.

9. A tool according to Claim 8, in which the annular punch is first adapted to be moved in advance of the perforating punch but arrested by a stop or the like after it has entered the annular space between the blank and the wall of the die, while leaving

the perforating punch able to continue its movement.

10. A tool according to Claim 9, in which the perforating punch and the annular punch are so connected together by means of springs that after the annular punch or a carrier or other part associated with it has come into contact with the die, the perforating punch is able to continue moving alone against the action of the springs.

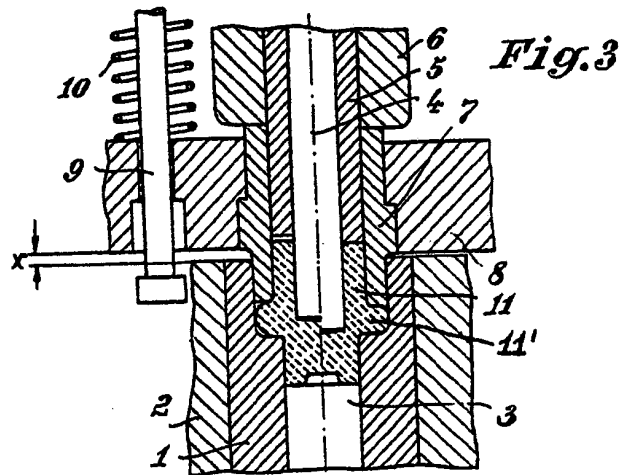
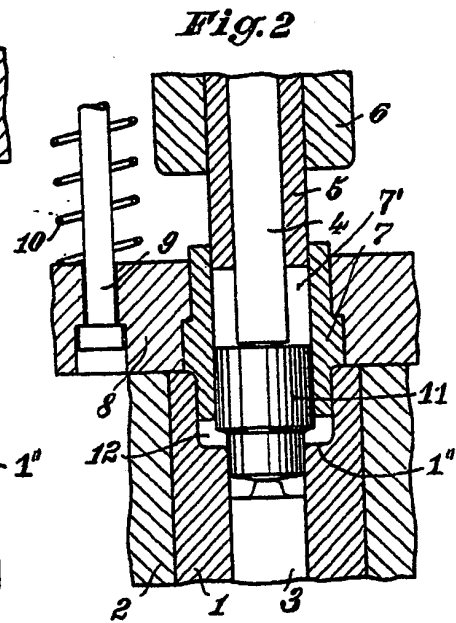
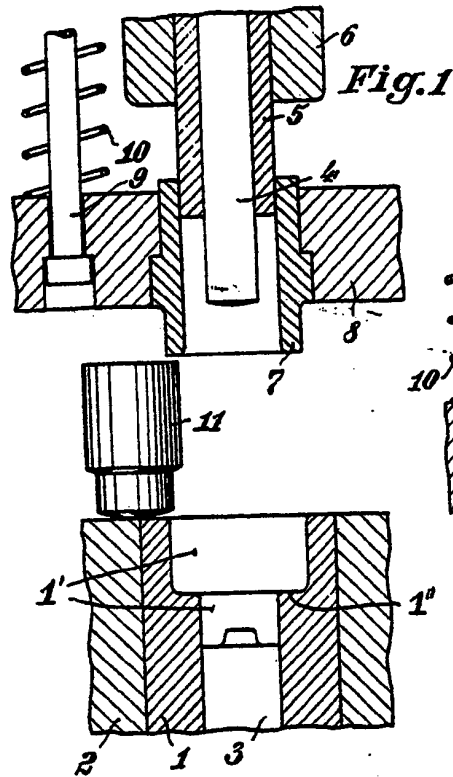
11. A tool according to Claim 10, in which the annular punch and the perforating punch are carried by parts which are connected together by studs and springs.

12. A tool according to Claim 10 or Claim 11, in which the springs are such that the annular punch is adapted to be moved by a short distance in the axial direction shortly before the end of the stroke of the press so as to enlarge the annular recess in the die and so that the material which has been radially displaced into that space can be given the desired final flange-shape towards the end of the stroke by the annular punch which is then moved together with the perforating punch.

13. A tool for making a hollow metal body having an external flange by cold-pressing a blank of steel or other metal substantially as hereinbefore described with reference to and as shown in the accompanying drawings.

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